

Title: Drones as On-Demand Infrastructure for Next-Generation Wireless Networks

Speaker: Dr. Ayon Chakraborty, Researcher at NEC Labs

Abstract:

Ubiquitous connectivity and sensing are among the grand challenge problems for next generation wireless systems, 5G and beyond. However, limitations exist in terms of resource management or infrastructure deployment (e.g., cell towers, IoT sensors etc) that hinders the realization of true ubiquity in various contexts. Often these deployments need to be on-demand, quick and temporary in order to avoid over-provisioning and maintenance costs. Recent advances in unmanned aerial vehicle (UAV) technology or drones have the potential to change the landscape of wide-area wireless connectivity and sensing by bringing a new dimension – “mobility” to the network infrastructure itself. I will demonstrate how drones can add a great value to state-of-the-art communication and sensing systems, particularly when such infrastructure are compromised (natural disasters), in-accessible (security threats), sparingly present or non-existent (rural areas). Our aim is to design a robust networked system that helps in effective communication and coordination among people (e.g., emergency responders) in such scenarios. In the first part of the talk, I will discuss how drones can be used as “flying” cellular base stations providing connectivity to clients on the ground. We will see how the position of the drone in 3D aerial space is critical in determining the overall connectivity to the clients located on the ground. Given the drone’s limited flight time, we explore how to quickly search for a near-optimal spot for the drone to operate at, optimizing the capacity of the wireless radio access network (RAN). In the second part, we will learn how the drones can also be used to localize such mobile clients in GPS-denied environments without access to any pre-deployed localization infrastructure. Overall, our contributions enhance the 5G’s vision for ubiquitous connectivity by providing on-demand support for connectivity and sensing in challenged environments.

Bio:

Ayon works as a researcher in the Mobile Communications and Networking group at NEC Laboratories America located in Princeton, New Jersey since 2017, after finishing his PhD in Computer Science from Stony Brook University, New York. He is broadly interested in designing mobile systems that interact with and interpret the physical world, spanning both algorithm design as well as system prototyping. He has held several internship positions at Bell Laboratories, Hewlett Packard Laboratories and Huawei Technologies leading to longer term collaborative efforts. He has regularly published in reputed venues for systems and networking including Infocom, NSDI, Mobicom, CoNext etc and was nominated for the best paper award at ACM Sigcomm IMC 2014. In 2011, Ayon finished his B.E. in Computer Science and Engineering from Jadavpur University, Kolkata where he was awarded the department gold medal/best project award. He is also a recipient of the DAAD WISE fellowship in 2010.